

REMARKS

In order to expedite prosecution, a personal interview with Examiner Song and Supervisor Utech was conducted on July 29, 2003. Applicant and Applicant's representative would like to thank Examiner Song and Supervisor Utech for their courtesy in conducting the interview and for their assistance in resolving issues. A summary of the interview is incorporated into the remarks that follow. Solely in order to help expedite prosecution, claims 18 and 29-30 have been canceled rendering the rejections thereto, though traversed, moot. Claims 11, 15 and 19 are the sole remaining independent claims.

Claims 11 and 28 stand rejected under 35 U.S.C. § 102 as being anticipated by Molnar. This rejection is respectfully traversed for the following reasons.

Claim 11 recites in pertinent part, "growing an epitaxial layer on a layered substrate which exhibits bowing." The Examiner admits that "Molnar is silent to the layered substrate exhibits bowing" but alleges that "this is inherent to Molnar because Molnar discloses a layered substrate of SiC and sapphire." However, as discussed during the interview, merely because Molnar discloses similar materials does NOT necessitate that the layered substrate would exhibit bowing. For example, in order to exhibit bowing, the two layers forming the layered substrate of Molnar would need to be bonded together via heating at sufficient high temperatures and subsequent cooling. Molnar, however, is completely silent as to the process for manufacturing the layered substrate.

As such, it is quite possible that the two layers of the layered substrate disclosed by Molnar are coupled together using adhesive without heating so as to NOT exhibit bowing.

Further, the layered substrate may not be cooled after manufacture thereof so as to maintain the same temperature as during epitaxial growth, so that the epitaxial layers are not grown on a bowed layered substrate (i.e., layered substrate not cooled before growing epitaxial layer thereon, whereas cooling would be necessary to allow the different thermal coefficients within the layered substrate to cause bowing; *see* page 10, lines 11-13 of Applicant's specification). As is well known in patent prosecution, "inherency may not be established by probabilities or possibilities" (see *Scaltech Inc. v. Retec/Tetra*, 178 F.3d 1378 (Fed. Cir. 1999)).

Nevertheless, in order to expedite prosecution, claim 11 has been amended to include the limitation of claim 28. As amended, claim 11 recites in pertinent part, "growing an epitaxial layer on a layered substrate which exhibits bowing so as to flatten said bowed layered substrate." That is, claim 11 as amended now requires that initial bowing exhibited by the layered substrate be reduced by growing an epitaxial layer so that the layered substrate exhibits less bowing (or eliminates bowing altogether) than the initial bowing exhibited by the layered substrate before the epitaxial layer was grown thereon.

The Examiner admits that "Molnar is silent to growing an epitaxial layer ... so as to flatten the bowed layered substrate" but alleges that such a process "is inherent to Molnar because Molnar discloses forming a similar epitaxial layer on a similar substrate." However, even assuming *arguendo* that Molnar discloses a bowed layered substrate, growth of an epitaxial layer on the bowed layered substrate does NOT inherently flatten the substrate so as to be less bowed than before growth of the epitaxial layer. As illustrated, for example, in Figure 2C of Applicant's drawings, reducing the bowing in the

layered substrate depends on many variables such as the materials, relative thermal coefficients, relative thicknesses, processing parameters, etc..

Molnar is silent as to bowing, let alone the needed parameters to reduce the bowing (i.e., flatten). Only Applicant has considered the bowing problem and determined the needed parameters to enable a reduction in bowing. In fact, Molnar discloses a layered substrate simply as a viable option rather than a preferred embodiment, whereas the present invention provides a layered substrate for purposely creating an initial bowing which can then be reduced (less bowing or no bowing; i.e., "flatten") by growing epitaxial layers which counter-act the initial bowing so that the **resulting** structure is flatter.

In contrast, epitaxial layers are conventionally grown on single substrates, resulting in a bowed final structure. Even in the layered substrate of Molnar, assuming *arguendo* such layered substrate has an initial bowing, there is no suggestion or motivation from the cited prior art for controlling the required parameters so that epitaxial growth will reduce the initial bowing. Indeed, as evidenced by Figure 2C of Applicant's drawings, bowing can quite easily be **increased** relative to an initial bowing depending on the various parameters. Nonetheless, as Molnar is silent as to the manufacturing process forming the layered substrate and the respective thicknesses, etc., based on Molnar, it is impossible to determine the amount of an initial bowing assuming *arguendo* there is bowing, let alone determine whether growing the epitaxial layer reduces the initial bowing.

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed, either expressly or inherently (noting that "inherency may not be

established by probabilities or possibilities" as held in the *Scaltech* case), in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), and because Molnar does not disclose or suggest, *inter alia*, "growing an epitaxial layer on a layered substrate which exhibits bowing so as to flatten said bowed layered substrate" as recited in claim 11, it is submitted that Molnar does not anticipate claim 11, nor any claim dependent thereon.

Claims 15 and 19 stand rejected under 35 U.S.C. § 103 over Hansson in view of Westmoreland. This rejection is respectfully traversed for the following reasons.

The Examiner admits that "Hansson does not disclose directly heating the substrate by a radiation source." The Examiner therefore relies on Westmoreland for disclosing direct heating and attempts to modify Hansson by moving the heat source to "within the reaction chamber to improve the deposition of reactant gases over a narrow temperature range ('331 col. 4, ln 64-68)" (*see* page 9, lines 1-3 of the outstanding Office Action).

However, Westmoreland does not disclose improving the deposition ***by using direct heating*** as relied on by the Examiner. Rather, Westmoreland discloses using ***pulsed heat, regardless if the heat source is within or outside the process chamber***, to achieve the stated purpose. In other words, it is respectfully submitted that the Examiner's asserted motivation for making the modification (i.e., to improve deposition of reactant gases...) is NOT attributable to the direct heating allegedly disclosed by Westmoreland. Instead, the improved deposition disclosed by Westmoreland and relied on by the Examiner as the motivation for modifying Hansson is expressly disclosed as

resulting from *pulsed* heating and is directed to improving deposition specifically into *vias*. That is, the object of Westmoreland is to conformally deposit a conducting material into contact vias. Westmoreland does so by using rapid thermal pulses to alternately deposit and diffuse a deposition gas over and into the deep recesses of a semiconductor structure whereby during interruption of heat the deposition gas diffuses thoroughly (*see, e.g., col. 2, lines 30-42; col. 4, lines 5-66 of Westmoreland*). As there are no contact vias in the growth method disclosed by Hansson, such a pulsed heating disclosed by Westmoreland is not relevant to Hansson in addition to the fact that Westmoreland does not provide any motivation for using a heat source within the process chamber.

In sum, Westmoreland provides no motivation or rationale for using a heat source within the process chamber. Indeed, Westmoreland discloses moving the heat source within the process chamber *independently* of the alleged motivation made by the Examiner (i.e., to improve deposition of reactant gases ...) as evidenced by the reference thereto *after* the improving-deposition purpose was already fully described with respect to thermal pulses. To this end, Westmoreland merely references using a heat source within the process chamber *incidentally* as a possibility rather than a preference (*see col. 5, lines 4-7; "a heat source ... can be located within the reaction chamber", rather than should or must be*).

Accordingly, it is respectfully submitted that the proposed modification of Hansson in view of Westmoreland is improper because the Examiner has not provided the requisite *objective* evidence *from the prior art* that "suggests the desirability" of the proposed combination. As is well known in patent law, a *prima facie* showing of obviousness can only be established if the prior art "suggests the desirability" of the

proposed combination using objective evidence. The Examiner is directed to MPEP § 2143.01 under the subsection entitled "Fact that References Can Be Combined or Modified is Not Sufficient to Establish *Prima Facie* Obviousness", which sets forth the applicable standard:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. (*In re Mills*, 16 USPQ2d 1430 (Fed. Cir. 1990)).

In the instant case, even assuming *arguendo* that Hansson can be modified by Westmoreland, it is submitted that the "mere fact that [Hansson and Westmoreland] can be combined ... does not render the resultant combination obvious" because nowhere does the *prior art* "suggest the desirability of the combination" as set forth by the Examiner. As noted above, the purpose and motivation arising from Westmoreland is directed to thermal pulses for depositing specifically into contact vias, and is indifferent to placing the heater in or out of the processing chamber.

The Examiner is further directed to MPEP § 2143.01 under the subsection entitled "Fact that the Claimed Invention is Within the Capabilities of One of Ordinary Skill in the Art is Not Sufficient by Itself to Establish *Prima Facie* Obviousness", which sets forth the applicable standard:

A statement that modifications of the prior art to meet the claimed invention would have been [obvious] because the references relied upon teach that all aspects of the claimed invention were *individually* known in the art is *not* sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. (citing *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993)).

In the instant case, even assuming *arguendo* that Hansson and Westmoreland "teach that all aspects of the claimed invention [are] individually known in the art", it is submitted

that such a conclusion "is not sufficient to establish a *prima facie* case of obviousness" because there is no **objective** reason on the record to combine the teachings of the cited prior art. Only Applicant has provided the requisite rationale for the combination of elements recited in claims 15 and 19, whereby direct heating can enable uniform heating for a bowed wafer (*see* page 13, lines 12-22 of Applicant's specification).

At best, the Examiner has attempted to show only that the elements of the claimed invention are **individually** known without providing a *prima facie* showing of obviousness that the **combination** of elements recited in the claims is known or suggested in the art. For all the foregoing reasons, it is submitted that the proposed combination of Hansson and Westmoreland is improper.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 11, 15 and 19 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also patentable. In addition, it is submitted that the dependent claims are patentable based on their own merits by adding novel and non-obvious features to the combination.

Based on all the foregoing, it is submitted that the pending claims are patentable over the cited prior art.

CONCLUSION

Having fully and completely responded to the Office Action, Applicant submits that all of the claims are now in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicant's attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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